

State of Rhode Island
Department of Administration / Division of Purchases
One Capitol Hill, Providence, Rhode Island 02908-5855
Tel: (401) 574-8100 Fax: (401) 574-8387

Solicitation Information
March 24, 2014

ADDENDUM # 4

RFQ # 7548457

TITLE: RENOVATIONS/EXPANSION OF URI BUTTERFIELD DINING HALL
Submission Deadline: Wednesday April 2, 2014 at 11:00 am (Local Time)

Notice to Vendors:

Attached is additional information related to this solicitation

Thomas Bovis
Interdepartmental Project Manager

Interested parties should monitor this website, on a regular basis, for any additional information that may be posted.

225 Chapman Street
Providence, Rhode Island
02905-4592

401.461.7771
fax 401.461.7772
email: v3@vision3architects.com

VISION³ ARCHITECTS



**UNIVERSITY OF RHODE ISLAND
ADDITIONS/RENOVATIONS TO BUTTERFIELD HALL
Kingston, Rhode Island
Architect's Project No. 12027a
March 18, 2014**

ADDENDUM No. 4: To the Drawings / Project Manual / Bid Documents for the Additions/Renovations to Butterfield Hall.

ITEM(S): Items No. 1 - 8

ATTACHMENTS:

- 230993 – Sequence of Operations for HVAC Controls, revised 3/11/14
- 263213 – Generator, dated 3/11/14
- 263600 – Auto Transfer Switches, dated 3/11/14
- Drawing E1.0 – Electrical Site Plan (Addendum #4, dated 3/11/14)
- Drawing C1.3 – Grading & Drainage Plan (Addendum #4, dated 3/11/14)
- Drawing C1.4 – Utility Plan (Addendum #4, dated 3/11/14)
- Drawing C1.6 – Detail Sheet 2 (Addendum #4, dated 3/11/14)
- Drawing E1.1 – Electrical Demolition Plan (Addendum #4, dated 3/11/14)
- Drawing E2.2 – Power & Systems Plan – Dining Room (Addendum #4, dated 3/11/14)
- Drawing E2.3 Power & Systems Plan (Addendum #4, dated 3/11/14)
- Drawing E2.4 Power & Systems Plan – Loading Dock (Addendum #4, dated 3/11/14)
- Drawing E2.5 Power & Systems Plan – Roof (Addendum #4, dated 3/11/14)
- Drawing E3.1 Kitchen Equipment Connection Schedule (Addendum #4, dated 3/11/14)
- Drawing E3.3 Electrical Panel Schedules (Addendum #4, dated 3/11/14)
- Drawing E3.4 Electrical Details & Schedules (Addendum #4, dated 3/11/14)
- Drawing E3.5 Electrical Details & Schedules (Addendum #4, dated 3/11/14)
- Drawing E3.6 Power Distribution Details (Addendum #4, dated 3/11/14)
- Drawing ED1.1 Electrical Dishroom Plans (Addendum #4, dated 3/11/14)
- Drawing MS1.3 Mechanical Site Utilities Revisions (Addendum #4, dated 3/11/14)
- Drawing M4.1 Mechanical Schedules (Addendum #4, dated 3/11/14)

PREPARED BY: Vision 3 Architects
225 Chapman Street
Providence, RI 02905

TO: All Bidders of Record

This Addendum No. 4 forms part of the Contract Documents and shall supersede the documents dated November 15, 2013, wherein it contradicts the same.

COPIES TO: All Bidders of Record
Owner
File

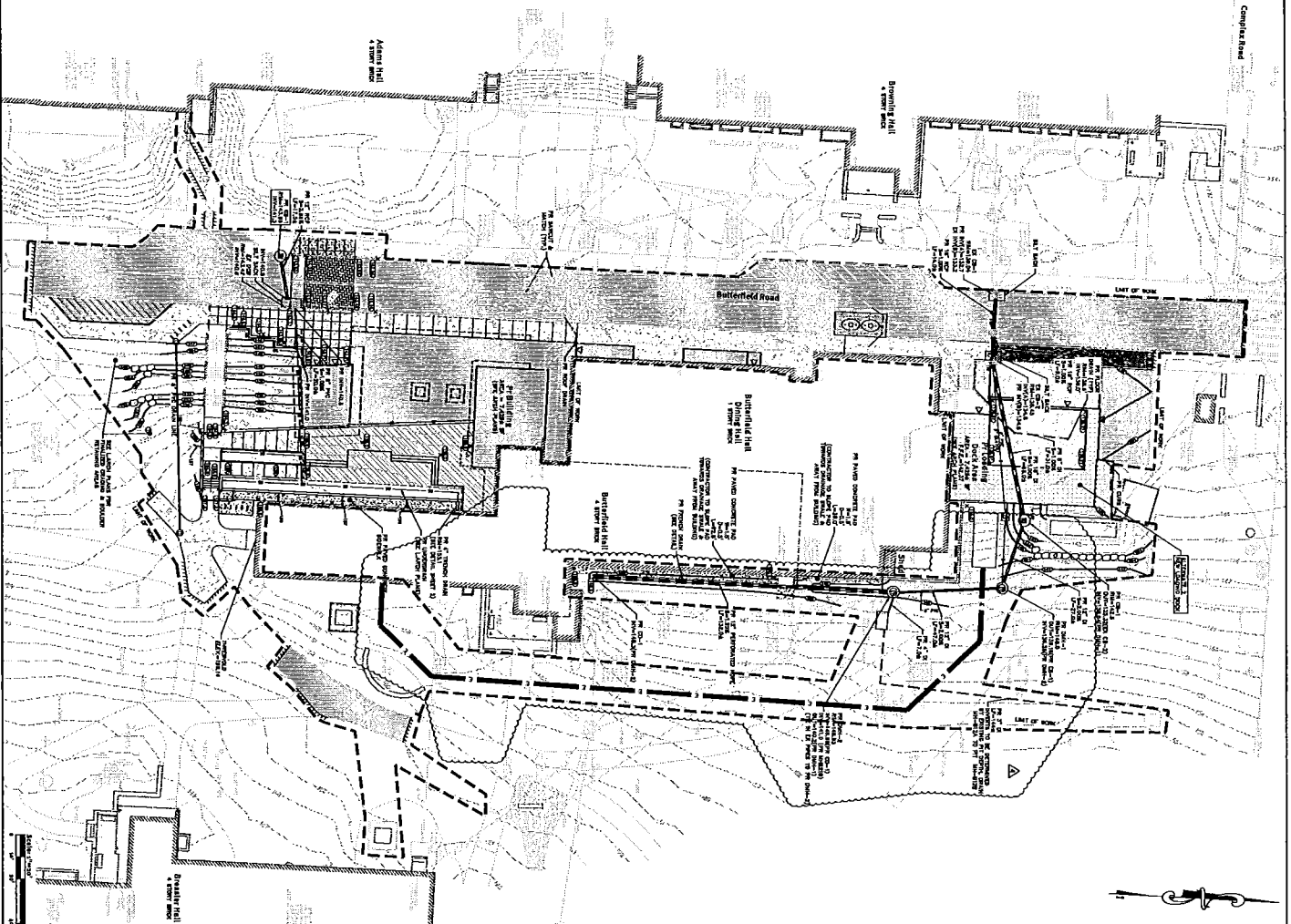
CHANGES TO THE PROJECT MANUAL:

- ITEM No. 1:** **230993 – Sequence of Operations for HVAC Controls**
Replace existing section with attached section revised March 11, 2014
- ITEM No. 2:** **263213 - Generator**
Add attached section, dated March 11, 2014, to Project Manual.
- ITEM No. 3:** **263600 – Automatic Transfer Switches**
Add attached section, dated March 11, 2014, to Project Manual

CHANGES TO THE DRAWINGS:

- ITEM No. 4:** **Revised Civil Drawings**
Replace existing drawings with revised drawings – C1.3, C1.4 & C1.6 (Addendum #4, dated 3/11/14).
- ITEM No. 5:** **Drawing MS1.3 – Mechanical Site Utilities Revisions**
Add Drawing MS1.3 – Mechanical Site Utilities Revisions (Addendum #4, dated 3/11/14) to the construction documents.
- ITEM No. 6:** **Revised Mechanical Drawings**
Replace existing drawing with revised drawing – M4.1 (Addendum #4, dated 3/11/14).
- ITEM No. 7:** **Revised Electrical Drawings**
Replace existing drawings with revised drawings - E1.0, E1.1, E2.2, E2.3, E2.4, E2.5, E3.1, E3.3, E3.4, E3.5, E3.6 & ED1.1 (Addendum #4, dated 3/11/14).
- ITEM No. 8:** **Drawing E3.6 – Power Distribution Details**
Add Drawing E3.6 – Power Distribution Details (Addendum #4, dated 3/11/14) to the construction documents.

END OF ADDENDUM NO. 4

[illegible][illegible]

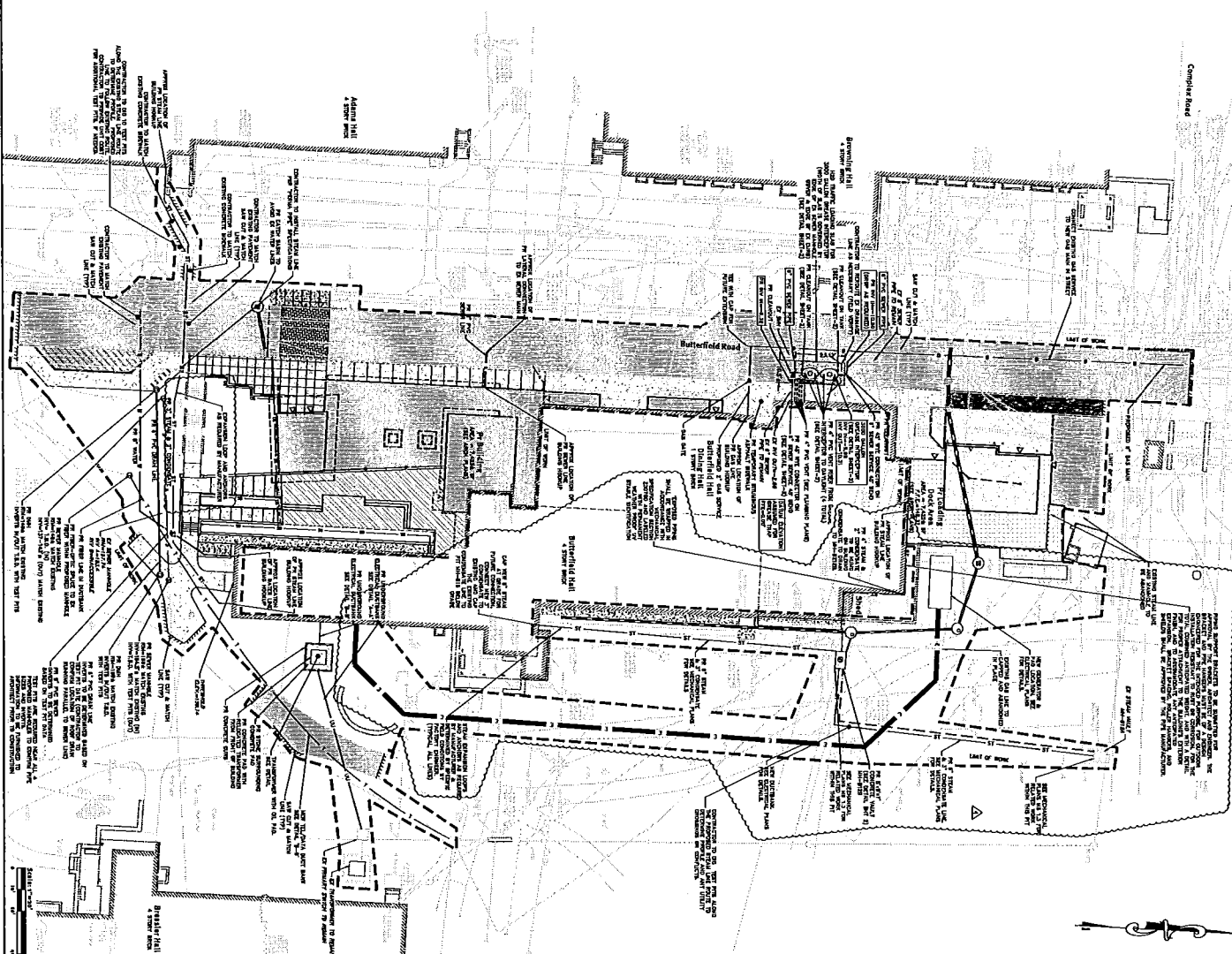
MOLEY R. STUBS
No. 7801
RECEIVED
PROSECUTOR GENERAL
PA.

VISION³ ARCHITECTS

GRADING &
DRAINAGE
PLAN
C1.3

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UNDESIGNED ELECTRIC		DESIGNED UTILITIES (ELECTRIC)	
UNDERGROUND	1	UNDERGROUND	1
OVERHEAD	2	OVERHEAD	2
WATER LINE	3	WATER LINE	3
SEWER LINE	4	SEWER LINE	4
NATURAL GAS	5	NATURAL GAS	5
TELEPHONE	6	TELEPHONE	6
TELEVISION	7	TELEVISION	7
COAXIAL CABLE	8	COAXIAL CABLE	8
POWER LINE	9	POWER LINE	9
STORM SEWER	10	STORM SEWER	10
RAIN WATER	11	RAIN WATER	11
SEWER TANK	12	SEWER TANK	12
SEWER PUMP	13	SEWER PUMP	13
SEWER MANHOLE	14	SEWER MANHOLE	14
SEWER CLEANOUT	15	SEWER CLEANOUT	15
SEWER VALVE	16	SEWER VALVE	16
SEWER TEE	17	SEWER TEE	17
SEWER BRANCH	18	SEWER BRANCH	18
SEWER JUNCTION	19	SEWER JUNCTION	19
SEWER ACCESS	20	SEWER ACCESS	20
SEWER CLEANOUT	21	SEWER CLEANOUT	21
SEWER VALVE	22	SEWER VALVE	22
SEWER TEE	23	SEWER TEE	23
SEWER BRANCH	24	SEWER BRANCH	24
SEWER JUNCTION	25	SEWER JUNCTION	25
SEWER ACCESS	26	SEWER ACCESS	26
SEWER CLEANOUT	27	SEWER CLEANOUT	27
SEWER VALVE	28	SEWER VALVE	28
SEWER TEE	29	SEWER TEE	29
SEWER BRANCH	30	SEWER BRANCH	30
SEWER JUNCTION	31	SEWER JUNCTION	31
SEWER ACCESS	32	SEWER ACCESS	32
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SEWER BRANCH	36	SEWER BRANCH	36
SEWER JUNCTION	37	SEWER JUNCTION	37
SEWER ACCESS	38	SEWER ACCESS	38
SEWER CLEANOUT	39	SEWER CLEANOUT	39
SEWER VALVE	40	SEWER VALVE	40
SEWER TEE	41	SEWER TEE	41
SEWER BRANCH	42	SEWER BRANCH	42
SEWER JUNCTION	43	SEWER JUNCTION	43
SEWER ACCESS	44	SEWER ACCESS	44
SEWER CLEANOUT	45	SEWER CLEANOUT	45
SEWER VALVE	46	SEWER VALVE	46
SEWER TEE	47	SEWER TEE	47
SEWER BRANCH	48	SEWER BRANCH	48
SEWER JUNCTION	49	SEWER JUNCTION	49
SEWER ACCESS	50	SEWER ACCESS	50
SEWER CLEANOUT	51	SEWER CLEANOUT	51
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SEWER BRANCH	54	SEWER BRANCH	54
SEWER JUNCTION	55	SEWER JUNCTION	55
SEWER ACCESS	56	SEWER ACCESS	56
SEWER CLEANOUT	57	SEWER CLEANOUT	57
SEWER VALVE	58	SEWER VALVE	58
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SEWER BRANCH	60	SEWER BRANCH	60
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SEWER CLEANOUT	63	SEWER CLEANOUT	63
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SEWER TEE	65	SEWER TEE	65
SEWER BRANCH	66	SEWER BRANCH	66
SEWER JUNCTION	67	SEWER JUNCTION	67
SEWER ACCESS	68	SEWER ACCESS	68
SEWER CLEANOUT	69	SEWER CLEANOUT	69
SEWER VALVE	70	SEWER VALVE	70
SEWER TEE	71	SEWER TEE	71
SEWER BRANCH	72	SEWER BRANCH	72
SEWER JUNCTION	73	SEWER JUNCTION	73
SEWER ACCESS	74	SEWER ACCESS	74
SEWER CLEANOUT	75	SEWER CLEANOUT	75
SEWER VALVE	76	SEWER VALVE	76
SEWER TEE	77	SEWER TEE	77
SEWER BRANCH	78	SEWER BRANCH	78
SEWER JUNCTION	79	SEWER JUNCTION	79
SEWER ACCESS	80	SEWER ACCESS	80
SEWER CLEANOUT	81	SEWER CLEANOUT	81
SEWER VALVE	82	SEWER VALVE	82
SEWER TEE	83	SEWER TEE	83
SEWER BRANCH	84	SEWER BRANCH	84
SEWER JUNCTION	85	SEWER JUNCTION	85
SEWER ACCESS	86	SEWER ACCESS	86
SEWER CLEANOUT	87	SEWER CLEANOUT	87
SEWER VALVE	88	SEWER VALVE	88
SEWER TEE	89	SEWER TEE	89
SEWER BRANCH	90	SEWER BRANCH	90
SEWER JUNCTION	91	SEWER JUNCTION	91
SEWER ACCESS	92	SEWER ACCESS	92
SEWER CLEANOUT	93	SEWER CLEANOUT	93
SEWER VALVE	94	SEWER VALVE	94
SEWER TEE	95	SEWER TEE	95
SEWER BRANCH	96		



ISO-METRIC VIEW

TOP VIEW

Proceptor
by greenhille®

NOTES:
1. THE PROCEPTOR IS A PRECAST CONCRETE UNIT WITH A 12" DIA. BASE AND A 12" DIA. TOP. IT IS DESIGNED TO BE MOUNTED ON A 12" DIA. BASE. THE PROCEPTOR IS A PRECAST CONCRETE UNIT WITH A 12" DIA. BASE AND A 12" DIA. TOP. IT IS DESIGNED TO BE MOUNTED ON A 12" DIA. BASE.

**GREENHILL (10022), (10023), 2000, 2800 AND 3000
INSTALLATION DRAWINGS**

TABLE E1

UNIT	BASE	HEIGHT	WEIGHT
10022	12"	12"	12"
10023	12"	12"	12"
2000	12"	12"	12"
2800	12"	12"	12"
3000	12"	12"	12"

TABLE E2

UNIT	BASE	HEIGHT	WEIGHT
10022	12"	12"	12"
10023	12"	12"	12"
2000	12"	12"	12"
2800	12"	12"	12"
3000	12"	12"	12"

Proceptor
by greenhille®

DETAIL A

DETAIL B

DETAIL C

DETAIL D

DETAIL E

DETAIL F

DETAIL G

DETAIL H

DETAIL I

DETAIL J

DETAIL K

DETAIL L

DETAIL M

DETAIL N

DETAIL O

DETAIL P

DETAIL Q

DETAIL R

DETAIL S

DETAIL T

DETAIL U

DETAIL V

DETAIL W

DETAIL X

DETAIL Y

DETAIL Z

DETAIL AA

DETAIL AB

DETAIL AC

DETAIL AD

DETAIL AE

DETAIL AF

DETAIL AG

DETAIL AH

DETAIL AI

DETAIL AJ

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DETAIL CM

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DETAIL CO

DETAIL CP

DETAIL CQ

DETAIL CR

DETAIL CS

DETAIL CT

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DETAIL CV

DETAIL CW

DETAIL CX

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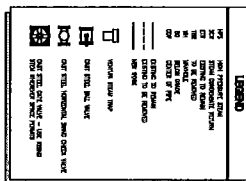
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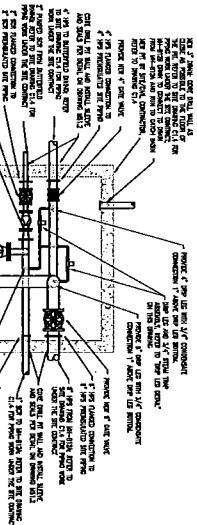
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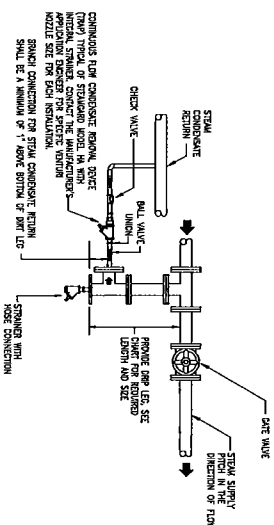
NEW STEAM P/T PIPING - EXISTING MH-B12A
2" = 1" = 1/2"

STEAM PIT PIPING REMOVALS - EXISTING MH-B12A
1/2" = 1'-0"



NEW WORK GENERAL NOTES

1. I read the report and am satisfied it has been written in full and that it is a true statement of the facts. I am satisfied that the report is a true statement of the facts and that it is a true statement of the facts and that it is a true statement of the facts.
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10. I am satisfied that the report is a true statement of the facts and that it is a true statement of the facts and that it is a true statement of the facts.



STEAM MAIN SIZE	DRIIP LEG SIZE	DRIIP LEG LENGTH
1/2"	1/2"	6"
3/4"	3/4"	6"
1"	1"	8"
2"	2"	8"
3"	3"	8"
4"	4"	10"
5"	4"	10"
6"	6"	12"
10"	6"	14"
12"	8"	18"
14"	8"	18"

STEAM DRIP LEG DETAIL



MS1.3

**MECHANICAL
SITE UTILITIES
REVISIONS**

UNIVERSITY OF RHODE ISLAND
ADDITION/RENOVATIONS TO
BUTTERFIELD HALL
KINGSTON, RI. 02881

**ISSUED FOR
CONSTRUCTION**

[illegible]

		
ҚАЗАҚСТАН РЕСПУБЛИКАСЫ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ	АКТӨБЕ ҚАЛАСЫ АКТӨБЕ АҚПАРАТ ЖӘНЕ ҚОҒАМ ҚАТЫНАСЫ МӘКТЕБІ	АКТӨБЕ ҚАЛАСЫ АКТӨБЕ АҚПАРАТ ЖӘНЕ ҚОҒАМ ҚАТЫНАСЫ МӘКТЕБІ

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MECHANICAL

REVISIONS

MS1.3

Case 20-267

VISION³ ARCHITECTS

8888 Gateway Blvd., Richmond, BC V6X 1A7 • Tel: 604-276-1773 • Fax: 604-276-1778 • info@chicofurniture.com

VISION ARCHITECTS

—

Age Group	Yes (%)	No (%)
18-29	85	15
30-49	75	25
50-69	65	35
70+	55	45

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ISSUED FOR

VAV TERMINAL

03.11.16	03.11.16	03.11.16
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1/2" BORE, 30 INCH,
HORIZONTAL BLADE, NO FINGER HOLDS

03.11.16	03.11.16	03.11.16
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1001

1000

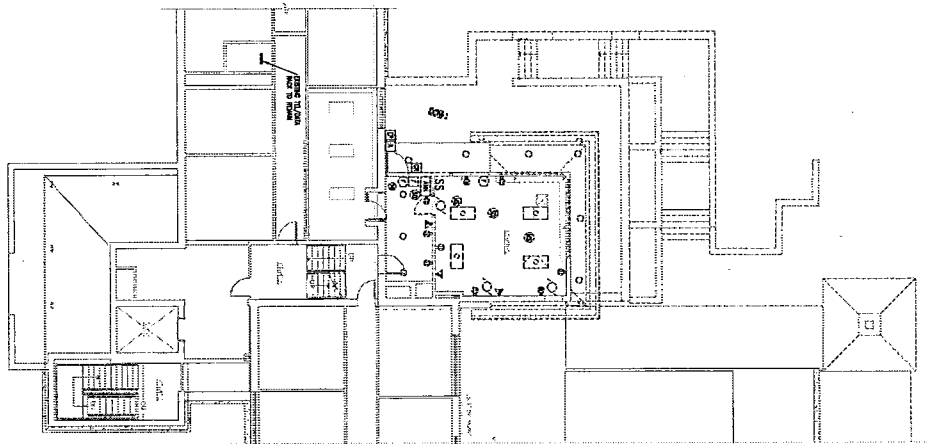
UNIVERSITY OF ALABAMA

UNP
AD

ONLINE BOOKS, SELF-HELP
ARTICLES, AND MUCH MORE BY
VIRAL & JACQUETTA, SPECIALISTS

CHILDREN, LOCALITIES, RURAL AREAS, AND PRODUCTION IN THE VENEZUELAN COUNTRY, 1990-1995.

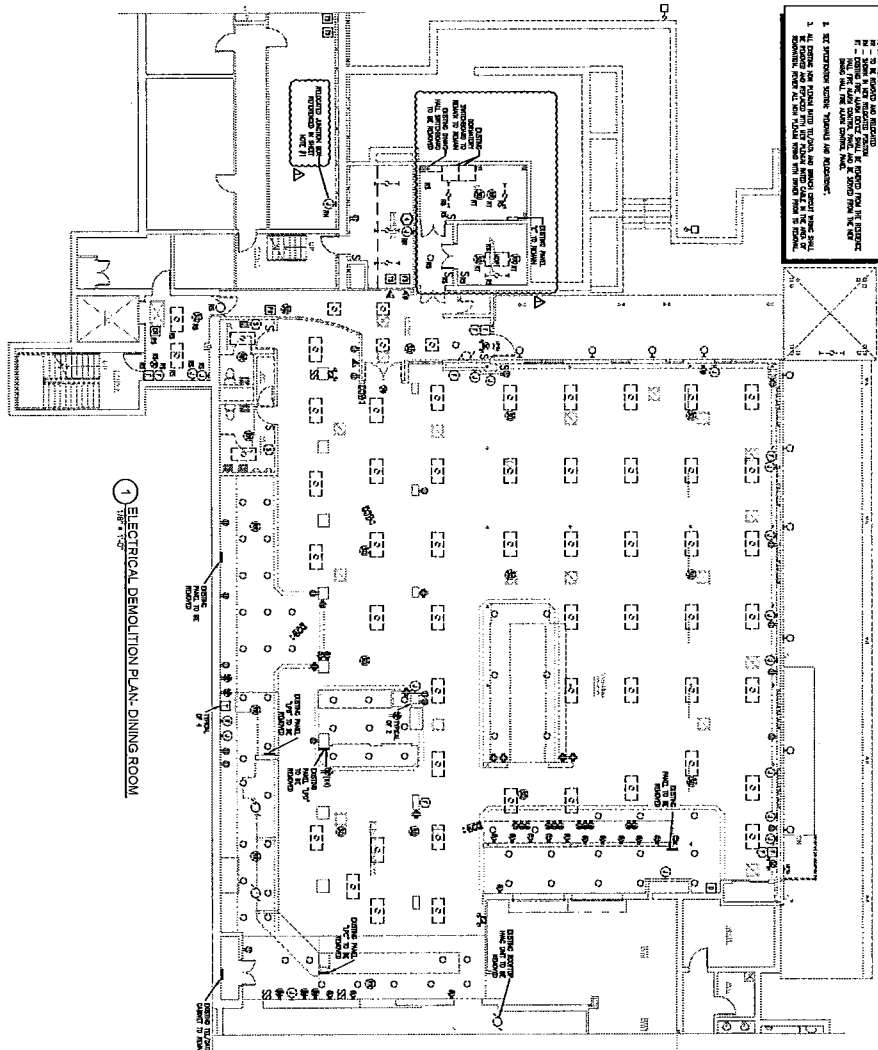
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2 ELECTRICAL DEMOLITION PLAN - LOUNGE
1/8" = 1'-0"

SHEET NOTES:

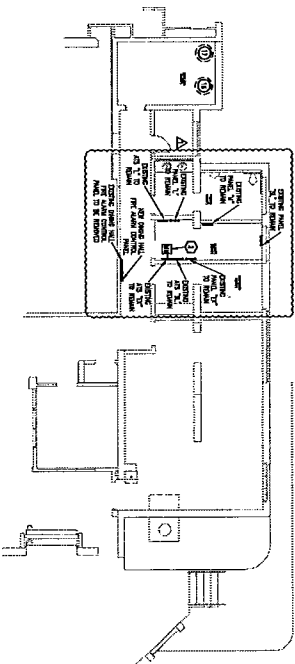
1. DEMOLISH ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES.
2. DEMOLISH ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES.
3. DEMOLISH ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES.



1 ELECTRICAL DEMOLITION PLAN - DINING ROOM
1/8" = 1'-0"

EXISTING ITEMS NOTES:

1. ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES ARE TO BE DEMOLISHED.
2. ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES ARE TO BE DEMOLISHED.
3. ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES ARE TO BE DEMOLISHED.



1 ELECTRICAL PLAN - BOILER/ELECTRIC ROOM
1/8" = 1'-0"

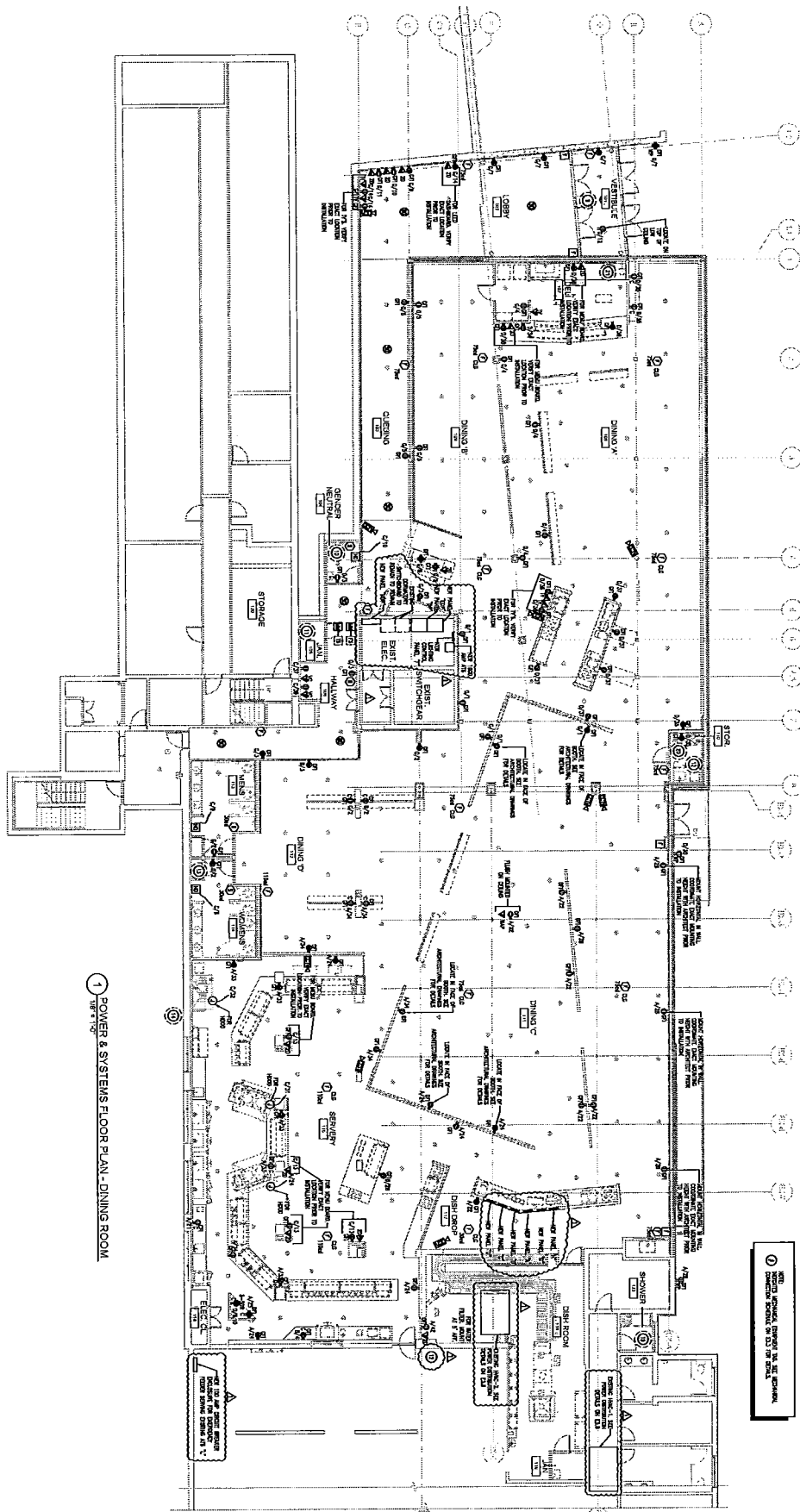
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KINGSTON, RI, 02881

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PROJECT TITLE	ELECTRICAL DEMOLITION PLAN
DATE	1/1/2011
PROJECT NO.	11111
DESIGNER	JAMES J. LAMBERT, P.E.
CHECKED BY	JAMES J. LAMBERT, P.E.
SCALE	AS SHOWN
NOTES	1. DEMOLISH ALL EXISTING ELECTRICAL SYMBOLS AND DEVICES.



1 POWER & SYSTEMS FLOOR PLAN - DINING ROOM

NOTE: SPECIAL SERVICES IN THE COMMON AREAS ARE INDICATED BY THE SHADING.

SEE 10-12 FOR POWER SYSTEMS FLOOR PLAN - DINING ROOM



E2.2

POWER & SYSTEMS FLOOR PLAN - DINING ROOM

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ISSUED FOR
CONSTRUCTION

DATE: 10/15/11
PROJECT NO: 1000000000
DRAWN BY: [Name]
CHECKED BY: [Name]
SCALE: AS SHOWN

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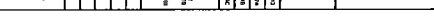
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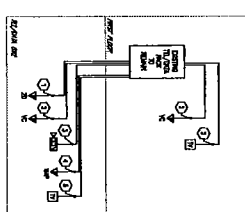
1. ALL STAFF SHALL BE PROVIDED IN THE APPROPRIATE MANNER WITH CONTINUING EDUCATION OPPORTUNITIES TO MEET THE REQUIREMENTS FOR THE COUNCIL'S CERTIFICATION PROGRAM.
2. ALL TELLER POLICIES SHALL BE REVIEWED AND APPROVED BY THE BOARD OF DIRECTORS AND THE BOARD OF DIRECTORS SHALL BE RESPONSIBLE FOR THE IMPLEMENTATION OF THE POLICIES.
3. THE BOARD OF DIRECTORS SHALL BE RESPONSIBLE FOR THE IMPLEMENTATION OF THE POLICIES.

1. ALL STAFF SHALL BE PROVIDED IN THE APPROPRIATE MANNER WITH CONTINUING EDUCATION OPPORTUNITIES TO MEET THE REQUIREMENTS FOR THE COUNCIL'S CERTIFICATION PROGRAM.
2. ALL TEACHERS SHALL BE PROVIDED WITH THE OPPORTUNITY TO PARTICIPATE IN THE COUNCIL'S PROFESSIONAL DEVELOPMENT PROGRAM.
3. THE COUNCIL SHALL BE PROVIDED WITH THE OPPORTUNITY TO PARTICIPATE IN THE COUNCIL'S PROFESSIONAL DEVELOPMENT PROGRAM.

TEL/DATA SHEET NOTES:

- ① DB-3007 3-1/2"X4"
- ② DB-3007 VOLUME CONTROL 3-1/2"X4" 300WATT MAXIMUM POWER.
- ③ (220) DB-3007 SPEAKER CROWN 1-1/2" X 1-1/2"X4"
- ④ DB-3007 SPEAKER CROWN 1-1/2"X4" LONG X 1 1/2" DIA. AT THE STRONG DB-3007A AND DB-3007B WERE PROVIDED.
- ⑤ (7) DB-3007 3-1/2"X4" 1-1/2"X4"

- TEL/DATA SHEET NOTES:**
- ① DB-3007 3-1/2"X4"
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 - ⑤ (7) DB-3007 3-1/2"X4" 1-1/2"X4"

TEL/DATA SYSTEM SCHEMATIC
NTS

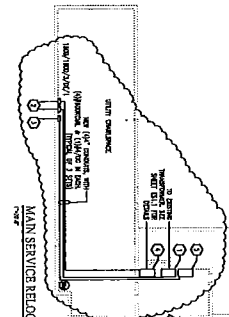
SHEET NOTES:

1. REMOVE DURING REINFORCING CHANGING PERIODS. THE EXISTING REINFORCING SHOULD BE REMOVED AND THE NEW REINFORCING SHOULD BE PLACED IN THE FORMWORK. THE FORMWORK SHOULD BE REMOVED AFTER THE NEW REINFORCING CEMENTS HAVE SET.
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3. DISAPPEARANCE TO REINFORCING NOT REQUIRED. REINFORCING SHOULD BE REMOVED AFTER THE NEW REINFORCING CEMENTS HAVE SET.
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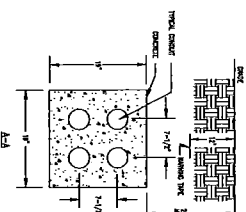
- SHEET NOTES:**

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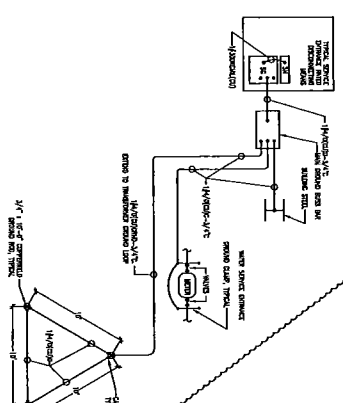
MAIN SERVICE RELOCATION DETAIL
Page



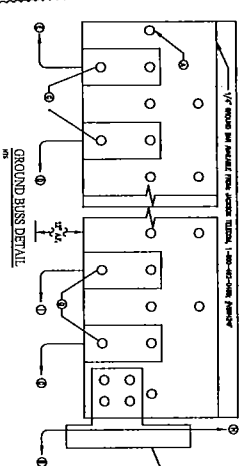
CONCRETE ENCASED DUCTBANK DETAIL



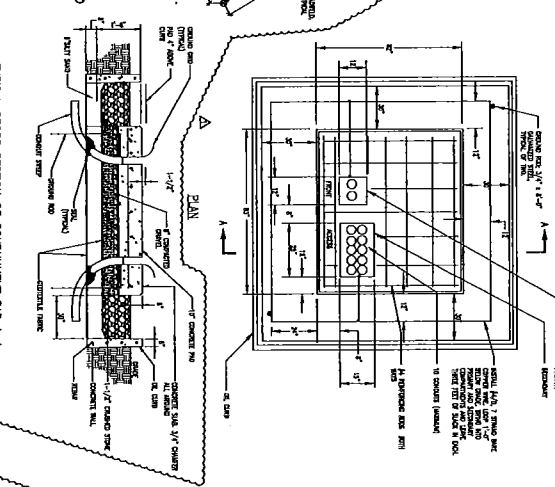
SERVICE GROUNDING DETAIL



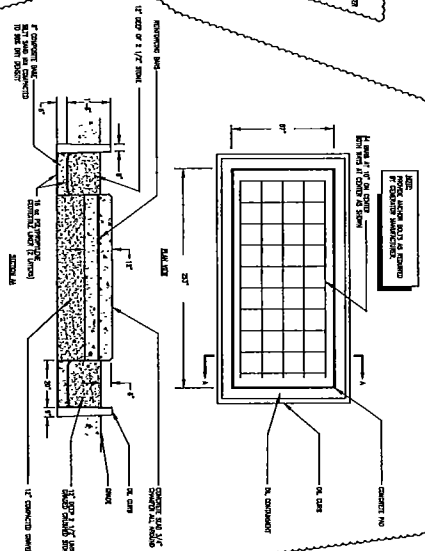
GROUND BUSS DETAIL



NOT TO SCALE (CONFORM TO POWER COMPANY STANDARDS)



GENERATOR PAD WITH OIL CURB DETAIL



NOTES:
1. FINGER IN S.
2. SEE SHORT NOTE TO SW SHORT C. FOR ADDITIONAL DETAILS.

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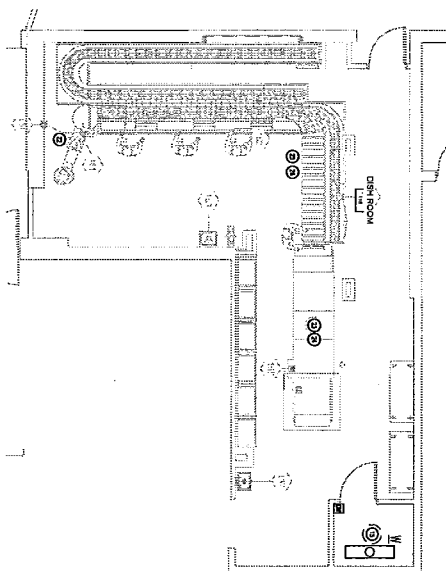
CEC/ 2012/

EXISTING ITEMS NOTES:

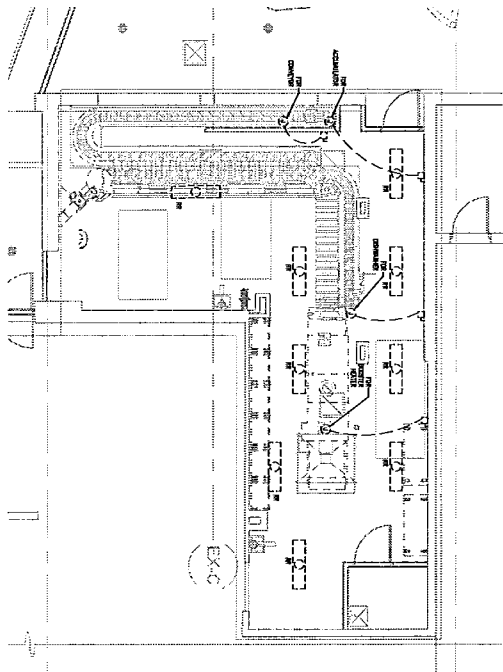
1. ALL EXISTING ITEMS SHOWN SHOULD BE TO BE REMOVED & NEW ITEMS, EQUIPMENT, MATERIALS, AND FINISHES TO BE INSTALLED AS SHOWN ON THIS SHEET.

2. SEE SPECIFICATION SECTION THROUGHOUT AND RELEVANT.

1 ELECTRICAL RENOVATION - DISHROOM



1 ELECTRICAL RENOVATION - DISHROOM



2 ELECTRICAL DEMOLITION - DISHROOM

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PROJECT REVIEW

DATE	REVISION
10/1/11	1.0
10/1/11	1.1
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10/1/11	2.00



ED1.1

SECTION 230993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment.
- B. See Division 23 Section "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.
- C. Provide controls to make systems function in accordance with good practice considering energy conservation and actual intended use for all equipment that is not covered by these descriptions. All starters shall have HAND/OFF/AUTO function. Label all starters with phenolic nameplates indicating equipment serviced.
- D. Provide low temperature safety thermostat on all equipment connected to fresh air. Each coil shall have an auto-reset safety thermostat with the bulb laced across the coil. Coils with more than 20 square feet shall have two thermostats. When activated, the unit coil valve shall open, the fan shall stop, the fresh air damper shall close and an alarm conditions shall be enabled at the work station. The thermostat shall reset, but the unit shall not return to normal operation until it is reset at the BMS workstation.
- E. Smoke Detection: All equipment over 2,000 CFM shall include fire alarm interface to shut down. During detection of smoke or a general alarm condition, the unit shall be deactivated and the exhaust fan shall be de-energized & supply/return dampers shall be closed. Duct mounted smoke detectors are furnished by Division 26 for installation in the ductwork by Division 23 and wiring by Division 26.
- F. **The Temperature Control Panel shall be located in the Main Dining Electric Room.**
- G. **Provide wiring/contacts at the new transfer switches necessary to indicate operation on Emergency Power serving HVAC units. Coordinate with the Electrical Contractor.**
- H. **Test HVAC units for restart time and program delays as necessary to stagger equipment restart after switching to Emergency power.**

1.2 SEQUENCE OF OPERATION

A. Packaged Rooftop Unit (RTU-1)

1. General:

- a. Provide all necessary field installation; interlock wiring and programming to accomplish the sequence of operations described herein.
- b. RTU shall be provided with a programmable, 7-day space thermostat located as shown on floor plan.
- c. Coordinate schedule of occupied/unoccupied cycle with building owner.

2. Unoccupied Mode:

- a. General: The supply fan will be off, the return air damper will be open & the outside air damper will be closed.
- b. Heating: If the zone temperature drops below the night setback temperature of 60°F (adj), the supply fan shall start, and the gas valve shall modulate to provide heating. The unit shall

run in full heating until the zone temperature is above the night setback temperature plus a 3°F (adj) differential.

- c. Cooling: If the zone temperature rises above the adjustable night setback temperature of 85°F (adj), the supply fan will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the zone temperatures drop below the cooling night setback temperature set point plus a 3°F (adj) differential.

3. Occupied Mode:

- a. The supply fan shall run continuously and the outside and return air dampers shall index to open at minimum position.
- b. Occupied heating - if the space is calling for heat, the controller shall stage the gas furnace as needed to maintain the space temperature set point. Cooling shall be locked out.
- c. Occupied cooling - if the space is calling for cooling, the controller shall cycle on the cooling circuit to maintain space temperature set point. Heating shall be locked out.
- d. Economizer - if the space is calling for cooling and the outside air enthalpy sensor determines that the outside air is suitable for cooling, the unit shall utilize economizer cooling.

4. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:

- a. Start/Stop & Mode of Operation (heat / cool / economizer)
- b. Fan Status (on / off)
- c. Outdoor Air Temperature
- d. Supply Air Temperature
- e. **Space Temperature**
- f. **Space Temperature Set Point**
- g. Any Alarms

5. Alarms:

- a. An automatic reset low temperature limit detection thermostat in the discharge of the unit will shut down the unit, close the outside air dampers, and open the return air damper if it senses a discharge temperature lower than 36° (adj) at any time. Restart of the unit shall require a signal from the BMS workstation.
- b. An alarm shall be generated at the operator workstation if any of the following occurs:
 - A failure or alarm is detected from the unit's internal controls.
 - If the unit is unable to maintain the temperature set point for an adjustable period.

B. Central Station Air Handling Unit (**HVAC-4**)

1. General:

- a. The temperature set points of the FT (finned tube radiation) thermostats shall be indexed to the heating set point of HVAC-4.
- b. **Unit shall have two power supplies to allow operation of the supply fan, exhaust fan, energy wheel, and furnace section off of power supplied by the emergency generator; the compressor/condenser shall be off normal power.**

2. Unoccupied Mode:

- a. General: The supply fan and exhaust fan will be off, the energy recover wheel will be de-energized, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.

- b. Heating: The 1st stage of heating for the zone served by HVAC-4 shall be the perimeter finned-tube radiation (FT-1). If the zone temperature sensed at HVAC-4 thermostat remains below the night setback temperature of 55°F (adj) for more than 30 minutes (adj.) then unoccupied heating shall be enabled at HVAC-4, the supply fan shall start at minimum speed and the gas heating shall be enabled. The unit shall run in full heating until the zone temperature rises above the night setback temperature plus a 3°F (adj) differential.
 - c. Cooling: If the zone temperature rises above the adjustable night setback temperature of 85°F (adj), the supply fan (& exhaust fan if utilizing economizer cooling) will start at minimum speed. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the selected zone temperatures drops below the cooling night setback temperature set point plus a 3°F (adj) differential. Unoccupied cooling shall be disabled if either FT control in this zone is calling for heating.
3. Warm-up/Cool-down Mode:
- a. General: The supply fan and exhaust fan will be off, the energy recover wheel will be de-energized, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.
 - b. Heating: If the selected zone temperature is below the HVAC-4 warm-up temperature set point of 65°F (adj), the 1st stage of heating for the zone served by HVAC-4 shall be the perimeter finned-tube radiation (FT-1). If the zone temperature remains below the set point for more than 30 minutes (adj.) then the HVAC unit will go into warm up mode. The supply fan shall start, the gas heating shall be enabled and the air handling unit will then run in full heating until the zone temperature rises above the adjustable warm-up mode exit set point of 68°F (adj). The unit will then exit warm-up mode and switch into occupied mode.
 - c. Cooling: If the selected zone temperature is above the cool down temperature set point of 77°F (adj), the unit will go into cool down mode. The supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the zone temperature drops below the adjustable cool down mode exit set point of 74°F (adj). The unit will then exit cool down mode and switch into occupied mode. Cooling shall be disabled if either FT control in this zone is calling for heating.
4. Occupied Mode:
- a. General: The supply/exhaust fan & energy recovery wheel shall be energized. The AHU outside air damper & exhaust air damper shall modulate to maintain CO2 levels for demand control ventilation; if the CO2 sensors are satisfied the outside air damper will be closed. The sensed CO2 level to be maintained is 800 ppm (adj.) as an average sensed by the room sensor and the return air sensor.
 - b. Energy Recovery Wheel (ERW):
 - 1) The energy recovery wheel will be controlled by an integral VFD and will utilize the manufacturer's internal controls to modulate speed.
 - 2) In Heating Mode: If the CO2 set point is satisfied and there is no call for the outdoor air damper to open for CO2 response, the ERW will be off and the outdoor air damper will be closed. When the CO2 sensor calls for the outdoor air damper to modulate open, the VFD speed on the ERW will vary between the minimum and maximum output to correspond to the Supply Air temperature set point, the supply fan speed (to satisfy thermostat requirement), and outdoor air damper position (to satisfy CO2 sensor requirement).
 - 3) In Cooling Mode: If the CO2 set point is satisfied and there is no call for the outdoor air damper to open for CO2 response, the ERW will be off and the outside air damper will be closed. When the CO2 sensor calls for the outdoor air damper to modulate open, the VFD speed on the ERW will vary between the minimum and maximum output to correspond to the Supply Air temperature set point, the supply fan speed (to satisfy thermostat requirement), and outdoor air damper position (to satisfy CO2 sensor requirement). When utilizing economizer cooling the energy recovery wheel shall be de-energized.

- 4) If the Exhaust Air temperature drops below the Freeze protection set point the VFD speed will decrease (regardless of the Supply Air temperature). If the VFD alarm contact closes, the VFD speed output will drop to the minimum allowed and an alarm shall be generated. When the VFD alarm is corrected, the system will return to controlling the VFD speed.
 - c. Occupied:
 - 1) The unit's supply fan will modulate (controlled by an integral VFD) to satisfy the thermostat requirements and maintain a minimum discharge air set point of 50°F (adj).
 - 2) On a call for heating the supply fan and the gas heating shall modulate to maintain the space temperature set point of 70°F (adj).
 - 3) On a call for cooling the supply fan shall modulate and the unit will utilize economizer cooling or mechanical cooling to maintain the space temperature set point of 74°F (adj). If during the cooling cycle the enthalpy of the interior/return air is greater than the enthalpy of the outside air, the energy recovery wheel will be de-energized and the air handling will utilize the lesser enthalpy outside air.
 - d. Humidity Control: If the space humidity levels rise above the set point 60% RH (adj) the air handling unit will index into de-humidification mode. The unit shall sub-cool the air to 47°F (adj) and then reheat to 65°F (adj) for discharge to the space.
5. Alarms:
- a. An manual reset low limit detection thermostat in the supply air duct will shut down the unit, de-energize the supply and exhaust fans, and energy recovery wheel, close the outside air dampers, and open the return air damper if it senses a discharge temperature lower than 40° (adj) at any time. Restart of the unit shall require a signal from the workstation, manual switch or portable plug in device.
 - b. Smoke Detection: All equipment over 2,000 CFM shall include fire alarm interface to shut down. During detection of smoke or a general alarm condition, the unit shall be deactivated and the exhaust fan shall be de-energized & supply/return dampers shall be closed.
 - c. An alarm shall be generated at the operator workstation if any of the following occurs:
 - A failure is detected of any variable speed drives
 - If the unit is unable to maintain the space temperature set point for an adjustable period
 - If return air rises above the maximum CO2 level set point for an adjustable period
 - **If the cooling section is disabled due to operation on Emergency power.**
6. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:
- Start/Stop & Mode of Operation
 - Outside Air Temperature
 - Outside Airflow CFM
 - Supply Air Temperature
 - Supply Airflow CFM
 - Return Air Temperature
 - Mixed Air Temperature
 - Space Temperature
 - **Space Temperature Set Point**
 - Return Air Humidity
 - Alarms (Smoke, Low Limit, VFD failure, CO2)
 - Fan Status (supply/exhaust)
 - Energy Recovery Wheel Status
 - Compressor Status
 - **Condenser Fan Status**
 - Gas Heating Valve Position
 - VFD output (hz) (supply/return fan, Energy Wheel)
 - Space CO2 level

- Return Air CO2 level
- Emergency power operation

C. Central Station Air Handling Unit (HVAC-3 with VAV-1, 2, 3, & 4)

1. General:

- a. Unit shall have two power supplies to allow operation of the supply and exhaust fan off of power supplied by the emergency generator; the compressor/condenser shall be off normal power.

2. Unoccupied Mode:

- a. General: The supply fan and exhaust fan will be off, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.
- b. Heating: If the selected zone temperature drops below the night setback temperature of 60°F (adj), the supply fan shall start, the zone's VAV HW coil heating shall be enabled. The unit shall run in full heating until the selected zone temperature rises above the night setback temperature plus a 3°F (adj) differential. The 1st stage of heating for the zone served by VAV-1 shall be the perimeter finned-tube radiation (FT-1). If the zone temperature remains below set point for more than 30 minutes (adj.) then unoccupied heating shall be enabled at VAV-1. Cooling at VAV-1 shall be disabled if either FT control in this zone is calling for heating.
- c. Cooling: If the zone temperature rises above the adjustable night setback temperature of 85°F (adj), the supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the selected zone temperatures drop below the cooling night setback temperature set point plus a 3°F (adj) differential.

3. Warm-up/Cool-down Mode:

- a. General: The supply fan and exhaust fan will be off, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.
- b. Heating: If the selected zone temperature is below the warm-up temperature set point of 65°F (adj), the unit will go into warm up mode. The supply fan shall start, the zone's VAV HW coil heating shall be enabled. The unit shall run in heating until the selected zone temperature rises above the adjustable warm-up mode exit set point of 4 degrees below the specified zone's Occupied set point (adj). The unit will then exit warm-up mode and switch into occupied mode. The 1st stage of heating for the zone served by VAV-1 shall be the perimeter finned-tube radiation (FT-1). If the zone temperature remains below set point for more than 30 minutes (adj.) then VAV coil heating shall be enabled at VAV-1. Cooling at VAV-1 shall be disabled if either FT control in this zone is calling for heating.
- c. Cooling: If the selected zone temperature is above the cool down temperature set point of 75°F (adj), the unit will go into cool down mode. The supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the zone temperature drops below the adjustable cool down mode exit set point of 72°F (adj). The unit will then exit cool down mode and switch into occupied mode.

4. Occupied Mode:

- a. General: The supply/exhaust fan shall be energized. The AHU outside air damper & exhaust air damper shall modulate to maintain space static pressure levels.
- b. Occupied: The supply and exhaust fan shall be energized. The AHU fresh air damper & return air damper shall index to its minimum outside air position. The supply fan will be controlled by the variable frequency drive. The VFD will ramp up the supply fan to maintain a static pressure set point of 1" w.c. (adj) 2/3 down the longest duct run. The exhaust fan shall be controlled by a VFD. The exhaust fan's VFD will speed up or slow down the exhaust fan to maintain a space static pressure set point of 0.02" w.c. (adj). The unit will then utilize

economizer cooling, mechanical cooling, mechanical cooling with outside air or steam pre-heat, to maintain the supply air discharge temperature set-point. If during the cooling cycle the enthalpy of the interior/return air is greater than the enthalpy of the outside air, the outside air dampers will open fully to utilize the lesser enthalpy outside air.

- c. Supply Air Discharge Set Point: The supply air set point will be reset based on signals from the four VAV zones, with the zones calling for cooling given priority. If any zone is calling for cooling the supply air set point shall be 50°F (adj). If no zones are calling for cooling the set point shall be adjusted to the minimum required to satisfy the zone with the lowest minimum temperature requirement.
- d. Humidity Control: If the space humidity levels rise above the set point 60% RH (adj) the AHU will index into de-humidification mode. The unit shall cool the air to 47°F (adj) and the VAV boxes shall re-heat coil controls valve shall modulate open to maintain space temperature.
- e. Outdoor Air & Exhaust: The outdoor air position shall be indexed to correspond to the status and VFD % capacity of the Kitchen Hood Exhaust Fans (KEF-1, 2, & 3). A minimum occupied outdoor air total shall be 400 cfm. The outdoor air shall increase to a maximum position of 4200 cfm, except in Economizer cooling mode when up to 100% outdoor air is permitted. As each KEF is energized at minimum capacity, the outdoor air amount shall increase by 400 cfm; as each KEF increases speed the outdoor air total shall increase to correspond based on airflow station readings. If Economizer cooling is enabled while the KEFs are operating, the AHU exhaust fan's VFD will speed up or slow down the AHU exhaust fan to maintain a space static pressure set point of 0.02" w.c. (adj).

5. Alarms:

- a. A manual reset low limit detection thermostat in the supply air duct will shut down the unit, de-energize the exhaust fan, close the outside air dampers, open the return air damper if it senses a supply air discharge temperature lower than 40° (adj) at any time. Restart of the unit shall require a signal from the workstation, manual switch or portable plug in device.
 - b. Smoke Detection: All equipment over 2,000 CFM shall include fire alarm interface to shut down. During detection of smoke or a general alarm condition, the unit shall be deactivated and the exhaust fan shall be de-energized & supply/return dampers shall be closed.
 - c. An alarm shall be generated at the operator workstation if any of the following occurs:
 - A failure is detected of any variable speed drives
 - If the unit is unable to maintain the space temperature set point in any zone for an adjustable period
 - **If the cooling section is disabled due to operation on Emergency power.**
6. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:

- Start/Stop & Mode of Operation
- Outside Air Temperature
- Outside Airflow CFM
- Supply Air Temperature
- Supply Airflow CFM
- Return Air Temperature
- Return Air Humidity
- Return Air CFM
- Mixed Air Temperature
- Space Temperature
- Alarms (Smoke, Low Limit, VFD failure, space static pressure)
- Fan Status (HVAC-3 supply/exhaust, & KEF-1, 2, 3)
- Compressor Status
- **Condenser Fan Status**
- Steam Heating Valve Position (normally open-spring return)
- Space static pressure level
- **Emergency power operation**

D. Variable Air Volume Unit with Reheat (**VAV-1, 2, 3 & 4 associated with HVAC-3**)

1. Unoccupied Mode:

- a. VAV dampers shall be 100% open. As space temperature approaches the night set back temperature set points of 85°F (adj) cooling & 60°F (adj) heating for VAV zones 1 & 2, and set points of 78°F (adj) cooling & 55°F (adj) heating for VAV zones 3 & 4, the individual VAV dampers shall modulate closed to prevent space overheating or overcooling.
- b. The 1st stage of heating for the zone served by VAV-1 shall be the perimeter finned-tube radiation (FT-1). If the zone temperature remains below set point for more than 30 minutes (adj.) then unoccupied heating shall be enabled at VAV-1. Cooling at VAV-1 shall be disabled if either FT control in this zone is calling for heating.

2. Warm-Up/Cool-Down Mode:

- a. VAV dampers shall be 100% open. As space temperature approaches the warm-up/cool-down mode exit set point of 72°F (adj) cooling & 68°F (adj) heating the individual VAV dampers shall modulate closed to prevent space overheating or overcooling.

3. Occupied Mode:

- a. Occupied: On a rise in space temperature above space set point the VAV damper shall modulate open to allow an increase in supply air to maintain a heating space temperature set point of 72°F (adj) and a cooling space temperature set point of 75°F (adj) at VAV-1 & VAV-2, and a heating space temperature set point of 68°F (adj) and a cooling space temperature set point of 72°F (adj) at VAV-3 & VAV-4. On a drop in space temperature the VAV damper shall modulate closed to reduce supply airflow in an attempt to maintain space temperature set point of 72°F. On a continued drop in space temperature the box shall index to the heating airflow and the heating coil control valve shall modulate open as required to maintain the space temperature set-point. On a rise in temperature, the reverse action shall occur, i.e. the reheat coil control valve & VAV damper shall modulate closed. On a continued rise in space temperature the VAV damper shall modulate open with the coil control valve closed.
- b. VAV-1 with perimeter Baseboard Heat: The 1st stage of heating for the zone served by VAV-1 shall be the perimeter finned-tube radiation (FT-1). If the zone temperature remains below set point for more than 30 minutes (adj.) then occupied heating shall be enabled at VAV-1. Cooling at VAV-1 shall be disabled and the VAV damper shall be at minimum position if either FT control in this zone is calling for heating.

4. A dead-band of 3° F (adj) shall be included to avoid hunting between unit heating/cooling actions.

5. An alarm shall be generated at the operator workstation if any of the following occurs:

- Any space temperature drops below 55°F (adj) or above 85°F (adj) during the unoccupied period
- Any zone is out of range by 10% (adj) when compared to set point during the occupied period for an adjustable time.
- If space static pressure level rises or falls out of range by 10% when compared to set point for an adjustable period

6. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:

- Air Flow CFM
- Discharge Air Temperature
- Hot Water Valve Position
- Space Temperature
- Supply Air Temperature
- **Space Temperature Set Point**

E. Baseboard (FT-1)

1. The control valve shall index to maintain space temperature set point. For FT zones associated with VAV-1 on HVAC-3 the set point shall be indexed to the same setting as VAV-1; for FT zones associated with HVAC-4 the set point shall be indexed to the same setting as HVAC-4.
2. The ATC contractor shall provide monitoring and set point adjustment for the following points on the BMS control system:
 - Hot Water Valve Position
 - Space temperature

F. EXISTING Central Station Air Handling Unit (HVAC-1 with HW Duct Coils)

1. General:

- a. The existing equipment shall be connected to and programmed in the new ATC system.
- b. Provide any new controllers, contacts, relays, actuators, sensors, thermostats, and wiring necessary to accomplish the intent of this Specification.
- c. A signal from the BMS contact at the Electric Emergency Transfer Switch shall disable the compressor/condenser section of this unit. Mechanical cooling will not be available when operating on Emergency Power.
- d. A dead-band of 5° F (adj) shall be included to avoid hunting between unit heating/cooling actions.

2. Unoccupied Mode:

- a. General: The supply fan and exhaust fan will be off, the bypass air damper will be open & the outside air/exhaust air dampers will be closed. The hot water reheat coil valves shall be full open.
- b. Heating: If the selected zone temperature drops below the night setback temperature of 60°F (adj), the supply fan shall start, the zone's HW coil heating shall be enabled, the zone valve on zones not calling for heating shall close. The unit shall run in full heating until the selected zone temperature rises above the night setback temperature plus a 3°F (adj) differential.
- c. Cooling: If any zone temperature rises above the adjustable night setback temperature of 85°F (adj), the supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the selected zone temperatures drop below the cooling night setback temperature set point plus a 3°F (adj) differential.

3. Warm-up/Cool-down Mode:

- a. General: The supply fan and exhaust fan will be off, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.
- b. Heating: If any selected zone temperature is below the warm-up temperature set point of 65°F (adj), the unit will go into warm up mode. The supply fan shall start, the zone's HW coil heating shall be enabled. The unit shall run in heating with the zone's control valve fully open until the selected zone temperature rises above the adjustable warm-up mode exit set point of 4 degrees below the specified zone's Occupied set point (adj). The unit will then exit warm-up mode and switch into occupied mode.
- c. Cooling: If the selected zone temperature is above the cool down temperature set point of 75°F (adj), the unit will go into cool down mode. The supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the zone temperature drops below the adjustable cool down mode exit set point of 72°F (adj). The unit will then exit cool down mode and switch into occupied mode.

4. Occupied Mode:

- a. **General:** The supply/exhaust fan shall be energized. The AHU outside air damper & exhaust air damper shall modulate to minimum position. Each zone's hot water coil valve shall operate to maintain individual thermostat setpoints.
- b. **Occupied:** The supply and exhaust fan shall be energized. The AHU fresh air damper & return air damper shall index to its minimum outside air position. The supply fan will operate continuously when in occupied mode. The exhaust fan will operate only when in full economizer cooling mode. The unit will then utilize economizer cooling, mechanical cooling, mechanical cooling with outside air or steam pre-heat, to maintain the supply air discharge temperature set-point. If during the cooling cycle the enthalpy of the interior/return air is greater than the enthalpy of the outside air, the outside air dampers will open fully to utilize the lesser enthalpy outside air.
- c. **Supply Air Discharge Set Point:** The supply air set point will be reset based on signal from the Office zone. If the Office zone is calling for cooling the supply air set point shall be adjusted to the minimum required to satisfy the temperature requirement (55°F minimum). If the Office zone is calling for heating the set point shall be 75°F. When Mechanical cooling is operating the heating circulator pump P-2 shall be disabled.

5. Alarms:

- a. An manual reset low limit detection thermostat on the steam coil will shut down the unit, close the outside air dampers, open the return air damper if it senses a supply air discharge temperature lower then 40° (adj) at any time. Restart of the unit shall require a signal from the workstation, manual switch or portable plug in device.
- b. **Smoke Detection:** All equipment over 2,000 CFM shall include fire alarm interface to shut down. During detection of smoke or a general alarm condition, the unit shall be deactivated and the supply and exhaust fan shall be de-energized & supply/return dampers shall be closed.
- c. An alarm shall be generated at the operator workstation if any of the following occurs:
 - If the unit is unable to maintain the space temperature set point in any zone for an adjustable period
 - If the cooling section is disabled due to operation on Emergency power.

6. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:

- Start/Stop & Mode of Operation
- Outside Air Temperature
- Supply Air Temperature
- Return Air Temperature
- Space Temperatures
- Space Set points
- Supply Air Set point
- Alarms (Smoke, Low Limit, Emergency Power)
- Fan Status (HVAC-1 supply/exhaust)
- Compressor Status
- Condenser Fan Status
- Steam Heating Valve Position (normally open-spring return)
- Emergency power operation

G. EXISTING Central Station Air Handling Unit (HVAC-2)

1. General:

- a. The existing equipment shall be connected to and programmed in the new ATC system.
- b. Provide any new controllers, contacts, relays, actuators, sensors, thermostats, and wiring necessary to accomplish the intent of this Specification.

- c. A signal from the BMS contact at the Electric Emergency Transfer Switch shall disable the compressor/condenser section of this unit. Mechanical cooling will not be available when operating on Emergency Power.
 - d. A dead-band of 5° F (adj) shall be included to avoid hunting between unit heating/cooling actions.
2. Unoccupied Mode:
- a. General: The supply fan and exhaust fan will be off, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.
 - b. Heating: If the selected zone temperature drops below the night setback temperature of 60°F (adj), the supply fan shall start, the zone's HW coil heating shall be enabled, the zone valve on zones not calling for heating shall close. The unit shall run in full heating until the selected zone temperature rises above the night setback temperature plus a 3°F (adj) differential.
 - c. Cooling: If any zone temperature rises above the adjustable night setback temperature of 85°F (adj), the supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the selected zone temperatures drop below the cooling night setback temperature set point plus a 3°F (adj) differential.
3. Warm-up/Cool-down Mode:
- a. General: The supply fan and exhaust fan will be off, the bypass air damper will be open & the outside air/exhaust air dampers will be closed.
 - b. Heating: If the zone temperature is below the warm-up temperature set point of 63°F (adj), the unit will go into warm up mode. The supply fan shall start and the steam coil valve shall operate. The unit shall run in heating until the zone temperature rises above the adjustable warm-up mode exit set point of 4 degrees below the Occupied set point (adj). The unit will then exit warm-up mode and switch into occupied mode.
 - c. Cooling: If the selected zone temperature is above the cool down temperature set point of 80°F (adj), the unit will go into cool down mode. The supply fan (& exhaust fan if utilizing economizer cooling) will start. The air handling unit will then run in full cooling mode utilizing economizer or mechanical cooling until the zone temperature drops below the adjustable cool down mode exit set point of 78°F (adj). The unit will then exit cool down mode and switch into occupied mode.
4. Occupied Mode:
- a. General: The supply/exhaust fan shall be energized. The AHU outside air damper & exhaust air damper shall modulate to minimum position.
 - b. Occupied: The supply and exhaust fan shall be energized. The AHU fresh air damper & return air damper shall index to its minimum outside air position. The supply fan will operate continuously when in occupied mode. The exhaust fan will operate only when in full economizer cooling mode. The unit will then utilize economizer cooling, mechanical cooling, mechanical cooling with outside air or steam heat, to maintain the supply air discharge temperature set-point. If during the cooling cycle the enthalpy of the interior/return air is greater than the enthalpy of the outside air, the outside air dampers will open fully to utilize the lesser enthalpy outside air.
5. Alarms:
- a. An manual reset low limit detection thermostat on the steam coil will shut down the unit, close the outside air dampers, open the return air damper if it senses a supply air discharge temperature lower than 40° (adj) at any time. Restart of the unit shall require a signal from the workstation, manual switch or portable plug in device.
 - b. Smoke Detection: All equipment over 2,000 CFM shall include fire alarm interface to shut down. During detection of smoke or a general alarm condition, the unit shall be deactivated and the supply and exhaust fan shall be de-energized & supply/return dampers shall be closed.

- c. An alarm shall be generated at the operator workstation if any of the following occurs:
 - If the unit is unable to maintain the space temperature set point for an adjustable period
 - If the cooling section is disabled due to operation on Emergency power.
6. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:
 - Start/Stop & Mode of Operation
 - Outside Air Temperature
 - Supply Air Temperature
 - Return Air Temperature
 - Space Temperature
 - Space Set point
 - Alarms (Smoke, Low Limit, Emergency Power)
 - Fan Status (HVAC-2 supply/exhaust)
 - Compressor Status
 - Condenser Fan Status
 - Steam Heating Valve Position (normally open-spring return)
 - Emergency power operation
- H. Steam To Water Heat Exchanger (Heating HX-1)
 1. Steam control valve shall modulate to maintain a system water temperature of 180° F HWS at 30° OAT and 80° F HWS at 50° OAT (adjustable) and shall be enabled when the OAT is below 60°F (adjustable).
 2. The steam valve shall be closed until flow in the waterside of the heat exchanger is proven.
 3. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:
 - Supply and Return Water Temperature
 - Alarms (High Temperature, Low Flow/Loss of Water Flow)
 - Steam Heating Valve Position (normally closed-spring return)
- I. Circulator Pumps (P-1 & P-2)
 1. Heating hot water pumps shall be constant volume.
 2. Pump P-1 (Dining Hall) shall be enabled when the OAT is below 60°F (adjustable).
 - a. The pump shall run continuously when the OAT is below 40°F (adjustable).
 - b. Above 40°F OAT (adjustable) the pump shall start on a call for heat from any thermostat serving connected equipment.
 3. Pump P-2 (Office, Storage, Loading Dock) shall be enabled when the OAT is below 60°F (adjustable).
 - a. The pump shall start on a call for heat from any thermostat serving connected equipment.
 4. The BAS shall monitor and/or control the following with graphic representation and user selectable data trend recording:
 - Pump Status
 - Supply and Return Water Temperature (each circuit)
 - Heating Hot Water Flow Rate GPM (each circuit)
 - Alarms (Pump Failure)

J. Kitchen Hoods (KH-1,2,3) & Exhaust Fans (KEF-1,2,3)

1. The manufacturer supplied hood mounted switch shall be used energize/de-energize the associated exhaust fan at minimum speed.
2. When the kitchen equipment is in use, the hood/fan manufacturer's integral controls and fan VFD shall modulate the KEF operation to maintain exhaust capacity of the hood.
3. The ATC contractor shall provide monitoring for the following manufacturer's control points on the BMS control system with graphic representation and user selectable data trend recording:
 - Fan Status
 - VFD output (hz)
 - Alarms

K. Exhaust Fan (EF-1 & EF-6)

1. EF-1: When commanded to the occupied mode the exhaust fans shall energize and run continuously. When commanded to the un-occupied mode the fan shall be de-energized.
2. The ATC contractor shall provide monitoring for the following points on the BMS control system:
 - Start/stop
 - Fan Status

L. Exhaust Fans (EF-2 thru EF-5 & EF-7)

1. The exhaust fans shall be interlocked with the associated room's light switch.

M. Dishwasher Exhaust Fan (EF-8)

1. EF-8: When the dishwasher is in operating mode the exhaust fan shall energize and run continuously. When the dishwasher is off the fan shall be de-energized.
2. The ATC contractor shall provide monitoring for the following manufacturer's control points on the BMS control system with graphic representation and user selectable data trend recording:
 - Start/stop
 - Fan Status

N. Cabinet Unit Heater (CUH 1,2)

1. The units shall have constant flow of heating hot water (no control valve).
2. On a call for heat from an integral thermostat the unit fan shall start subject to an aqua-stat mounted on the HWR line.
3. The ATC contractor shall provide monitoring for the following points on the BMS control system:
 - Space temperature
 - Fan Status

O. Electrical Consumption Meter (For equipment and systems included in the Dining Hall)

1. The following points shall be monitored/controlled thru the BMS system:
 - Current, per phase & three-phase total
 - Voltage, per phase & three-phase total
 - Phase-to-phase & phase-neutral
 - Real Power (kW), per phase & three-phase total

- Reactive Power (kVAR), three phase total,
- Apparent Power (kVA), three phase total,
- Power Factor, per-phase & three-phase total,
- Real Energy (kWh), three phase total

P. Natural Gas Meter (HVAC-4 Only)

1. The following points shall be monitored/controlled thru the BMS system:
 - Consumption & Flow

Q. Domestic Water Meter (Women's Rm. 4, Men's Rm. 3, Gender Neutral 103, and Janitor 104)

1. The following points shall be monitored/controlled thru the BMS system:
 - Consumption & Flow

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 23 09 93

SECTION 263213

GENERATOR

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish, install and leave in perfect operating condition a complete emergency generator and transfer switch system with wiring for light, power, and signal as specified herein and shown on drawings.

1.2 REFERENCE STANDARDS

- A. National Electrical Code, 2011 Edition.
- B. Underwriters Laboratories
- C. ANSI
- D. NEMA

1.3 SHOP DRAWINGS

- A. Submit in accordance with Section 01300.
- B. Provide:
 - 1. Details of all equipment
 - 2. Emergency generator, housing and all accessories.
 - 3. Automatic transfer switches.
 - 4. Local switch override relays.
 - 5. Detailed specification sheets.
 - 6. Final factory test report certifying this unit's full power rating, stability, voltage and frequency regulation.
 - 7. Complete operating instructions and maintenance manual with parts list.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store in secure location.
- B. Do not mar or scratch finish.
- C. Protect from damage after installation.

1.5 RELATED REQUIREMENTS

- A. Basic Materials and Methods
- B. Conduit
- C. Wire and Cable

1.6 DESCRIPTION

- A. The emergency generator set shall consist of an engine driven generator assembly mounted on a structural steel skid, with all accessories required for proper automatic operation including but not limited to:
 - 1. Batteries, battery rack, battery cables, Battery Pad Heater
 - 2. Battery charger
 - 3. Engine controls
 - 4. Generator controls
 - 5. Fuel system (including base mounted fuel tank).
 - 6. Exhaust system
 - 7. Vibration Isolators
 - 8. Coolant system
 - 9. Lubrication system
 - 10. Weatherproof sound attenuating enclosure

1.7 QUALITY ASSURANCE

- A. The emergency generator set shall be the standard product of a manufacturer engaged exclusively in production of emergency power equipment, which has had at least 10 years experience in the manufacture of such equipment. The emergency generator set shall be factory assembled and tested with all specified accessories installed and operational, and test results submitted with shop drawings.

1.8 WARRANTY

- A. The equipment specified herein shall be warranted against defects by the generator manufacturer and the contractor for a period of 5 years as described in Section 16050, Paragraph 3.01 and shall promptly repair or replace any components or wiring, at no charge to the Owner, found defective during this period. Warranties from various component manufacturers will not be acceptable so as to provide for sole source of responsibility for this project. Warranty shall cover a temporary generator set and costs to wire it over the duration during which repairs are being performed if the duration exceeds 2 days.

1.9 ACCEPTABLE MANUFACTURERS

- A. Provide a Caterpillar generator as manufactured by Milton Cat, or approved equal. Note that the drawings and specifications are based on Caterpillar equipment. If any other products are substituted the electrical contractor shall be fully responsible for coordinating with other trades and bearing the cost of any modifications or changes required for proper acceptable operation of such equipment, including specified accessories.

1.10 OPERATION

- A. Operation of this unit shall be automatic such that upon the closure of the remote starting contacts from the automatic transfer switch the engine shall start and attain rated voltage and frequency within 10 seconds. All accessories shall be provided to assure starting within the above time frame under the ambient temperatures and conditions described herein.
- B. If the engine should fail to start within 45-90 seconds (adjustable) the cranking shall cease and a failure to start indication shall be shown on the control panel. This shut down must be manually reset.

- C. The engine generator set shall be capable of picking up full rated load in a single step upon start up with a voltage dip of no more than twenty percent. Thereafter the voltage shall be regulated within three percent by an automatic voltage regulator.
- D. After return of normal power the generator set shall run for 1 to 10 minutes (adjustable) to assure steady return of normal before transfer from emergency to normal power, after which the generator set shall continue to run unloaded for 1 to 30 minutes (adjustable) to cool down the engine.
- E. If at any time during the above operations any of the herein described safety shut-down conditions occur, the engine generator set shall shut down and the appropriate shut down indication shall be displayed on the control panel and remote annunciator.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Engine

- 1. The engine shall be water cooled, 4 cylinder, 4 cycle, Industrial type, diesel fueled, with a minimum displacement of 927 cubic inches, and a rated RPM of not more than 1800. All ratings shall be for standard temperatures and pressures and at a site elevation of 100 feet. The engine shall not run at any rpm higher than 1800.
- 2. The engine shall be turbocharged and after-cooled with a unit mounted radiator and pusher fan capable of operating at full rated load and for the full duration of the power failure with an ambient temperature of 122 degrees F. without deration.
- 3. The engine shall be equipped with a complete fuel system including:
 - a. fuel injection system
 - b. fuel line solenoid valve
 - c. hand priming pump
 - d. flexible fuel connections
 - e. fuel filters
 - f. double wall base mounted fuel tank,as well as any other components normally supplied or recommended by the engine manufacturer for this application. The unit shall be capable of running on Ultra Lo Sulfur Diesel.
- 4. The lubrication system shall be of the full pressure type with an engine driven oil pump. It shall be equipped with replaceable element spin-on oil filters of a type and quantity as recommended by the engine manufacturer. There shall be a low oil pressure cut out which shall shutdown the unit before damage can occur due to loss of oil pressure.
- 5. The engine shall be governed by an electronic governor capable of maintaining engine speed from no load to full load within one quarter of one percent (0.25%) of the governed speed of 1800 RPM.
- 6. The cooling system shall consist of a unit mounted radiator, a belt driven pusher fan, an engine mounted coolant circulating pump, a coolant thermostat, a duct flange adapter to discharge cooling air out of the housing. The cooling system shall be filled with a fifty percent (50%) ethylene glycol mixture.
- 7. The engine air intake system shall be filtered with a replaceable element filter of the type and quantity recommended by the engine manufacturer.

2.2 MOUNTING

- A. The complete engine and generator assembly shall be direct flywheel coupled and shall be mounted on a structural steel skid base designed to maintain proper alignment of the combination. Vibration isolators of the neoprene double deflection design shall be furnished between the engine generator and the base of the generator. The unit shall be certified to be free from damaging torsional vibrations at its synchronous speed.

2.3 GENERATOR

- A. Rating: The generator shall be rated for continuous standby service at 500 kW/625KVA, at .80 PF. 208/120 volts 3 phase, 4 wire, 60 hertz, connected at 1800 RPM.
- B. Provide locked rotor motor starting capability of 880 skVA at 30% instantaneous voltage dip as defined per NEMA MG 1. Sustained voltage dip data is not acceptable.
- C. Type: The Generator shall be revolving field type, 4 pole, brushless type exciter with drip proof construction. The armature shall have a single bearing with a minimum B-10 life of 40000 hours and shall be connected to the engine by a flexible connection. The generator shall conform to all NEMA standards. Insulation shall be class H with tropicalization and anti abrasion coatings
- D. Regulation: Shall be static type with silicon controlled rectifiers. Regulation shall be +/- 1% from no load to full load. There shall be a voltage adjust rheostat to provide a +/- 10% adjustment of the nameplate voltage. The generator shall be designed so that if any part of the regulation system should fail, the generator set will not exceed the system voltage. This ability shall be inherent in the design and shall not depend upon overvoltage shut down features. The regulator must have a minimum 250% short circuit withstand capability to insure stability during motor load fluctuations.

2.4 ENGINE JACKET HEATER

- A. A 3000 watt engine jacket heater with an adjustable thermostat shall be furnished and installed to maintain the engine jacket cooling water to a suitable temperature to assure engine starting and the ability to attain rated load within 10 seconds. The heater shall be installed at the factory and shall operate on 120 volts.

2.5 BATTERIES

- A. The starting batteries shall be 12_volt, heavy duty, lead acid type designed especially for industrial diesel engine starting applications. The minimum ampere hour capacity shall be as recommended by the manufacturer but in no case less than 210 per battery. Suitable battery racks meeting all of the most current NEC regulations shall be employed. The battery racks shall be designed for full containment of the battery electrolyte or fluids in the event of case failure thereby preserving and protecting the environment in the area of application. Cables shall be provided with the battery to provide a neat assembly and shall be factory mounted within the enclosure.

2.6 BATTERY CHARGER

- A. A battery charger with a stainless steel case shall be provided to maintain the starting batteries at full charge. It shall be current limiting or shall have a cranking relay so that the charger will not be damaged by engine cranking current requirements. It shall be solid state, full wave rectifier type, and shall maintain the batteries at the proper float voltage. The charger must be equipped with a float equalizer switch and light, high & low voltage alarms, and have a minimum of 10 ampere output.

2.7 BASE FUEL TANK

- A. There shall be a diesel fuel tank supplied as an integral part of the base of the unit. The tank shall have a minimum usable capacity of 1000 gallons; and shall be double walled with integral leak detection alarm and low fuel alarm wired to control panel. The fuel tank shall be installed in the generator manufacturer's factory and all fuel connections, vents, returns and fills shall be installed and tested prior to shipment. Field or dealer installed tank installations are not acceptable.
- B. This installation shall include but shall not be limited to the following:
 - 1. Double wall steel fuel tank of the rated capacity
 - 2. Enlarged steel skid base, full perimeter
 - 3. Fuel lines including supply, return and vent lines
 - 4. Fuel fill and vent piping
 - 5. Fuel level gauge
 - 6. Low fuel warning float switch
 - 7. Rupture Basin
- C. All required appurtenances recommended or required by the manufacturer for a complete and correct installation shall be supplied and the entire assembly shall be primed and painted with epoxy enamel to protect against corrosion. The custom color shall be ICI Paints #586 "Mansard Stone".
- D. A full tank of Ultra Low Sulphur Diesel shall be provided by the installing contractor and the tank shall be topped off after field testing has been completed.

2.8 EXHAUST SYSTEM

- A. Provide a high degree exhaust silencer suitable for critical silencing, complete with condensation drains, of a size recommended by the generator set manufacturer, but in no case less than 5 inches. The silencer shall be manufactured by Donaldson, Maxim, or equal. Provide a seamless stainless steel flexible connection of a type and size as recommended by the generator manufacturer and 24 inches long. If the Engine is a Vee type either an exhaust header to provide for a single outlet or dual exhaust systems shall be provided as recommended by the generator manufacturer. The exhaust silencer shall be mounted within the enclosure with the weight of the silencer supported by the enclosure not by the engine exhaust manifold. The entire exhaust system shall be factory installed in the enclosure by the manufacturer of the generator.

2.9 CONTROL PANEL

- A. Provide a generator mounted control and instrument panel constructed of 16 gauge steel with drip proof construction. This panel shall house the remote start and stop controls, the engine and generator meters as well as the safety shutdown and prewarning systems as specified herein.
- B. This control panel shall contain the following metering and measurements
 - 1. Voltage (L-L, L-N)
 - 2. Current (Phase)
 - 3. Average Volt, Amp, Frequency
 - 4. kW, kVA, kVAR (Average, Phase, %)
 - 5. Power Factor (Average, Phase)
 - 6. kW-hr, kVAR-hr (total)
 - 7. Excitation voltage and current
 - 8. Generator stator and bearing temp
- C. The control panel shall contain the following safety shutdowns and warnings:
 - 1. Low engine oil pressure

2. Engine Overspeed
3. High engine water temperature
4. Overcrank/failure to start
5. Low engine oil pressure prewarning
6. High water temperature prewarning
7. Low engine temperature warning
8. Low water level

D. All of the above warnings shall have individual indicating lights and individual manual resets.

E. The control panel shall contain the following engine instruments:

1. Engine oil pressure
2. Engine coolant temperature
3. Battery charging ammeter
4. Engine oil temperature
5. Battery voltmeter
6. Tachometer

F. The control panel shall also contain a mode selector switch with three positions. These positions shall be as follows:

1. Auto - The generator set shall start up and run when the transfer switch calls through the remote starting contacts.
2. Test - the generator set will run when put in this position unless one of the safety controls has been activated.
3. Off - the set will not run in this position.

2.10 REMOTE DERANGEMENT PANEL (ANNUNCIATOR)

A. Provide a remote mounted derangement panel to provide for remote indication of any of the following conditions. The panel shall be flush or surface mounted and shall contain an alarm with a separate silencing reset from that of the main reset for the faults. The following faults shall have indicating lights on the annunciator panel:

1. Engine low lubricating oil pressure – shutdown (light & alarm)
2. Low oil pressure - prewarning (light & alarm)
3. Engine high coolant temperature - shutdown (light & alarm)
4. High coolant temperature - prewarning (light & alarm)
5. Engine overspeed - shutdown (light & alarm)
6. Failure to start/overcrank - shutdown (light & alarm)
7. High starting battery voltage (light)
8. Low starting battery voltage (light)
9. Low fuel in main tank (light & alarm)
10. Leak in main tank (light & alarm)
11. Low engine temperature warning (light & alarm)
12. Generator running (to parallel generator running light at Fire Alarm System Control Panel)
13. Generator not in automatic (light & alarm)
14. Low coolant level (light)

B. A Remote emergency stop shall be furnished to be installed in the vicinity of the annunciator. The key will be held in a captive position when inserted into the remote annunciator for the purpose of remote emergency stop.

C. Provide a serial connection to annunciate each of the above faults on the remote derangement panel.

2.11 ENCLOSURE

- A. The complete engine generator set shall be enclosed within a weather protective sound attenuated galvanized steel, powder coated,, custom painted housing. Any additional costs for custom colors shall included in the bid. Color shall be ICI Paints #586 "Mansard Stone". All accessories specified within this specification shall be mounted within this housing including:
 - 1. Starting batteries
 - 2. Engine jacket heater
 - 3. Battery charger
- B. The enclosure shall have a resulting sound level of 75 dba @ 23ft with the genset running under full load.
- C. The entire sub-frame shall be primed and painted with epoxy enamel to provide a weather protective finish. The subframe must be full perimeter design and have four lifting appliances placed one on each corner to allow lifting of the entire module. The subframe shall be designed to securely mount the generator set and all other equipment specified herein.
- D. The interior of the enclosure shall incorporated provisions for mounting of the equipment specified herein. Mounting shall be on metal frame work and placement shall be as shown on the drawings at time of submittal. The intent of this mounting arrangement is to transmit the weight of the mounted equipment to the subframe directly. The exhaust shall be piped out of the enclosure and furnished with a shanty rain flapper. All exterior piping must be stainless steel.
- E. The enclosure shall be designed to completely cover the engine generator thereby providing weather protection for the entire system including the tank. The enclosure shall be produced and installed by the generator set manufacturer to insure compatibility of all systems. The enclosure must meet or exceed BOCA standards for structures of this nature, for the region of intended use, and as they pertain to roof loading as well as rain, snow, and wind loading. The enclosure must be designed to exceed 125mph wind loading.
- F. The weatherproof housing shall contain a terminal strip inside the control panel for connection of individual circuits for each of the following:
 - 1. Battery Pad Heater
 - 2. Battery Charger
 - 3. Jacket Water Heater
 - 4. Service Duplex Receptacle (GFCI type)
 - 5. Switch and weatherproof light.

2.12 LINE CIRCUIT BREAKER

- A. The generator shall be equipped with circuit breakers that have electronic trip units, with inverse time vs. current response to protect the unit from damage due to overload. Field circuit breakers alone will not meet this specification. This breaker shall be mounted either in the connection box on the generator or in a separate, adjacent NEMA 1 enclosure within weatherproof housing. All connections between the generator and the breaker shall be done at the factory. This breaker/s shall be rated as indicated on the drawings.

2.13 GUARANTEE

- A. The Contractor and the Generator Set Manufacturer shall guarantee all equipment and workmanship herein specified for a period of 5 years with no deductibles and shall promptly repair or replace any component or wiring, at no charge to the Owner, found defective during that period.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unit shall be installed where shown and under supervision of the generator manufacturer's field service engineer.
- B. Provide all necessary emissions documentation and submit application for emissions certificate. Provide approved emissions certificate to Owner.
- C. Electrical contractor to Provide full tank of Ultra low Sulfur Diesel fuel oil and "top-off" tank upon completion of field (site) testing.
- D. Provide certified test report of two hour load bank test 100% load followed by an on-site building load test.
- E. The supplier of the emergency power equipment shall provide a factory trained field service representative and all information needed for proper installation of the equipment prior to installation. After completion of the installation the supplier shall send a factory trained service representative to inspect the completed installation and determine if it is acceptable and make any recommendations for changes if it is not prior to start-up. The representative shall also startup and run the unit for a period of 2 hours and record during 30 minutes intervals the following:
 - 1. Engine water temperature
 - 2. Engine oil pressure
 - 3. Battery Charge rate
 - 4. AC volts (all Legs and Phase to Phase)
 - 5. AC amperes (all legs)
- F. After this test is completed and the results accepted by the field representative of the owner, the generator set shall be left in operating condition.
- G. The supplier of the emergency generator and the foreman for the electrical contractor shall provide a four hour training period for the owner's personnel. This training shall be conducted after all testing has been completed and operation and maintenance manuals have been turned over to the owner. Provide 48 hours written notification to the owner and record names of personnel present during this process.

Any adjustments required to the relays in the automatic transfer switch shall be accomplished under the direction of the Transfer Switch Manufacturer's Field Service Engineer.

END OF SECTION

SECTION 263600

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide where indicated on drawings automatic transfer switches of the sizes and capacities as shown.

1.2 REFERENCE STANDARDS

- A. UL - 1008 for use on emergency systems
- B. UL Listed (Integrated Equipment Rating) short circuit current rating and listed as suitable for use as service equipment where required.
- C. NFPA 70 – National Electrical Code
- D. NFPA 110 – Emergency and Standby Power Systems
- E. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power systems for Commercial and Industrial Applications.
- F. Nema Standard ICS 10-1993 (formerly ICS2-447) – AC Automatic Transfer Switches.
- G. UI 508 Industrial Control Equipment

1.3 RELATED WORK

- A. 260500 - Basic Materials and Methods

1.4 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit in accordance with Section 01330000.
- B. Indicate:
 - 1. Rating Mains and Control.
 - 2. Physical sizes, and enclosure type.
 - 3. Gutter sizes.
 - 4. Accessories.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Rating
 - 1. The automatic transfer switch rating shall be 1600 amps.

B. Construction and Performance

1. The transfer switches shall be double throw electrically operated and mechanically held, actuated by a single electrical operator, single-solenoid mechanism with a total transfer time not to exceed one half second. The transfer switch shall be capable of transferring successfully in either direction with 70 percent of rated voltage applied to switch terminals. Enclosures shall be NEMA type 1A. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions. Normal or Emergency.
2. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets or springs; and shall be silver-tungsten alloy. Separate arcing contacts, with magnetic blowouts, shall be provided on all transfer switches. Interlocked molded case circuit breakers or contactors are not acceptable.

- C. The transfer switches shall be equipped with a removable manual operating handle for maintenance purposes.

D. Controller Display and Keypad.

- A. A four line, 20 Character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via dip switches on the controller.

- a. Nominal line voltage and frequency
- b. Single or three phase sensing
- c. Operating parameter protection
- d. Transfer operating mode configuration

(Open Transition, Closed Transition, or Delayed Transition)

- B. All instructions and controller settings shall be easily accessible, readable and
C. Accomplished without the use of codes, calculations, or instruction manuals.

- E. Inspection of all contacts shall be possible from the front of the switch without disassembly of the operating linkages and without disconnection of power conductors. Switches rated 600 Amps and higher shall have front removable and replaceable contact. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.

F. Sequence of Operation

1. Engine starting contacts shall be provided to start the generating plant should the voltage of the normal source drop below 80 percent on any phase, after an adjustable time delay of 0-3 seconds to allow for momentary dips. The transfer switch shall transfer to emergency when 90 percent of rated voltage and frequency has been reached. After restoration of normal power on all phases to 90 percent of rated voltage, an adjustable time delay period of 0-30 minutes shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source. After retransfer to normal, the engine-generator shall be allowed to operate at no load for 5 minutes. A test switch shall be included to simulate normal power failure and pilot lights shall be mounted on the cabinet door to indicate the switch position. Two auxiliary contacts rated 25 amp, 120 volts, shall be mounted on the main shaft; one closed on normal, the other closed on

emergency. In addition, one set of relay contacts shall be provided to open upon loss of normal power supply. All relays, timers, control wiring and accessories shall be front accessible. All control wire terminations are to be identified by tubular sleeve-type markers.

2. Additional Controls for elevator loads shall be provided, when required, as follows:
 - a. An additional auxiliary contact mounted on the main shaft rated 25 amp, 120 volts, closed when the transfer switch is in the normal position, open when the transfer switch is in the emergency position.
 - b. Two auxiliary contacts normally closed, to open prior to transfer to either direction and re-close after an adjustable 1-300 second time delay after transfer.
- G. A time delay shall be provide on transfer to emergency, adjustable for 0 to 60 minutes, for controlled timing or transfer of loads to emergency.
- H. Two time delay modes (which are independently adjustable) shall be provided on re-transfer of normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable form 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
- I. A time delay shall be provided on the shutdown of emergency generator for cool down, adjustable from 0 to 60 minutes.
- J. A three position momentary-type test switch shall be provided for the test/automatic/reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal.
- K. The controller shall provider and internal engine exerciser. The engine exerciser shall allow the user to program up to seven different exercise routines.
 1. Enable or disable the routine.
 2. Enable or disable transfer of the load during routine.
 3. Set the Start time – time of day – day of week- week of month (1st 2nd 3rd, 4th, alternate or every)
 4. Set the duration of the run. At the end of the specified duration the switch shall transfer the load back to the normal and run the generator for the specified cool down period. A 10 year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information.
- L. The controller LCD display shall include a "system status" screen which shall be readily accessible from any point in the menu by depressing the "ESC" key a maximum of two times. This screen shall display a clear description of the active operating sequence and switch position. For example, Normal failed, Load on Normal, TD Normal to emergency 2min15s.
- M. Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.
- N. The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status and input signals to the controller which may be preventing load transfer commands form being completed.
- O. The controller shall be capable of interfacing, through an optional serial communication module, with a network or transfer switches, locally (up to 4000 ft.) or remotely through modem serial communications. Standard software specific for transfer switch applications shall be available by

the transfer switch manufacturer. This Software shall allow for the monitoring, control and setup of parameters.

P. Approval

1. As a precondition for approval, the manufacturer of the automatic transfer switches shall verify that his switches are listed by Underwriters Laboratories Inc., Standard UL-1008 with withstand at least equal to the interrupting rating of the circuit breaker and/or fuse that is specified to protect the circuit.

Withstand Capability (RMS Amps. Symmetrical)

Switch Ampere	*ATS Coordinated w/Molded Case Circuit Breakers	**ATS Coordinated w/Power Circuit Breakers
100-150	22,000	-----
225-800	42,000	36,000
1000-1600	65,000	36,000
2000-3000	73,000	-----

*TEST DURATION: 3 cycles at 480 volts, 10 percent PF.

**TEST DURATION: 18 cycles at 480 volts, 10 percent PF.

2. During the Withstand Test there shall be no contact welding or damage. The tests shall be performed on identical samples without the use of current limiting fuses. Oscillograph traces across the main contact shall verify that contact separation has not occurred. Test procedures shall be certified by Underwriters Laboratories or any nationally recognized independent testing laboratory.
3. When conducting temperature rise tests to Paragraph 17.3 of UL- 1008 the manufacturer shall include post-endurance temperature rise test to verify the ability of the transfer switch to carry full rated current after completing the overload and endurance tests.

2.2 MANUFACTURERS

- A. Equipment shall be manufactured by one of the following:

1. Automatic Switch Company, 7000 series
2. Russelectric

2.3 GUARANTEE

- A. The Contractor and the transfer switch manufacturer shall guarantee the transfer switch, material and workmanship for a period of time as described in Section 16050, Paragraph 3.01 and shall promptly repair or replace any components, at no charge to the Owner, found defective during that period.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting

1. Flush or surface as shown.
2. Shall be plumb vertically.
3. Top to be 6' - 0" above finish floor.

B. Nameplate

1. Provide Micarta nameplate indicating switch designation, voltage, and area served.

C. Protection

1. Install front immediately upon mounting of switch.
2. Maintain protective cover over baked enamel finish.

D. Adjustments

1. All adjustments made at the site to relay settings, etc. of the transfer switch shall be made under the direct supervision of a factory field service technician of the Transfer Switch Manufacturer.

END OF SECTION 263600